

TE-SEM-VI (EXTC) (REV.)

D.C.

23/5/13
May 2013

ws-Con-2013-31

Con. 9195-13.

GS-1120

(3 Hours)

[Total Marks : 100]

Note: i) Question no 1 is compulsory

ii) Solve any four out of remaining questions

iii) Figure to the right indicate full marks

Q1 Answer the following questions (Any four)

[20]

- Does the channel bandwidth requirement reduce by a factor of four in QPSK compared to BPSK?
- Does bandwidth restriction limit the use of Hadamard codes?
- Is it true that convolutional interleaving requires less memory and offers more flexibility?
- What are the different parameters which need to be examined before choosing a PCM waveform for a particular application?
- Derive the condition for maximum entropy of a source. How does entropy vary with probability?

Q2 a. Consider five messages given by the probabilities 0.5, 0.25, 0.125, 0.0625, 0.0625. Calculate H.

Use the Shanon-Fano Algorithm to develop efficient code and, for that code calculate the average number of bits/message. Compare with H. Calculate efficiency and redundancy. [08]

Q2 b. Consider a systematic block code whose parity check equations are: [12]

$$P_1 = m_1 + m_2 + m_4$$

$$P_2 = m_1 + m_3 + m_4$$

$$P_3 = m_1 + m_2 + m_3$$

$$P_4 = m_2 + m_3 + m_4$$

Where m_i is the i^{th} message digits and P_i are the i^{th} parity digits.

- Find the generator matrix and parity check matrix
- How many errors can be detected and corrected?
- If the received code word is 10101010, find the syndrome.

Q3 a. The bit stream $d(t)$ is to be transmitted using DEPSK. If the $d(t)$ is 0010 1001 1010, determine $b(t)$.

Show that after decoding, the data $d(t)$ is recovered. Show that if the fourth bit is in error, then

fourth and fifth bits, $d(t)$, will also be in error. [10]

Q3 b. What is M-ary PSK? Explain with constellation diagram. What is Euclidian distance for M-ary PSK?

Draw and explain 8-ary PSK system with constellation. What is the bandwidth of M-ary PSK? [10]

[TURN OVER

Q4 a. Can there be tradeoff between signal to noise ratio and bandwidth in calculation of channel capacity? Prove the upper limit of C is $C_{\infty} = 1.44 \frac{S}{\eta}$. [12]

Q4 b. For a (7, 4) cyclic code, the generating polynomial $g(x) = 1 + x + x^2$. Find the code word if data is (i) 0011, (ii) 0100. Show how cyclic code is decoded to get data word for previous case. [08]

Q5 a. Derive the expression for minimum probability of error for a matched filter. [08]

Q5 b. Generator vectors for a rate 1/3 convolutional encoder are: $g_1 = (101)$, $g_2 = (100)$, $g_3 = (111)$. Draw Encoder diagram, trellis diagram, using trellis find code vector if message vector is (101100), using Trellis find message vector, if third bit of code vector is in error. [12]

Q6 a. What is the necessity of equalizers in a transmission system? Explain any one equalizer. [10]

Q6 b. What is MSK? Draw and explain MSK transmitter and receiver. How it is different than GMSK. [10]

Q7 Write a note on any three; [20]

- Eye pattern and its application
 - Line code and its characteristics
 - Effect of Intersymbol interference
 - Block diagram of digital communication system
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